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Is culture a excluding factor for health care in Bolivia? Evidence of maternal health care utilization

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Is culture an excluding factor for health care in Bolivia? Evidence of maternal health care utilization

Christian A. Valencia

December, 2013*

Abstract

This document states the hypothesis that there are some cultural factors that are negatively related to health care utilization. Evidence of maternal health care is used to assess the hypothesis. Two different dependent variables are used, antenatal care and delivery assistance with a health professional. The set of covariates include predisposing factors (individual, household and cultural factors), characteristics of morbidity and characteristics of health system. Using the 2008 Demographic Health Survey (DHS) this document presents estimations of a logit model and average marginal effects. Results show that cultural factors are negatively related to health care utilization, through the estimation of its variables, self identification as native, first language and state. Yet, some individual characteristics as education and mainly wealth present higher significances. Therefore, short run policies should focus on improving wealth for selected groups of excluded women rather than other policies as improving education.

JEL Classification: I15, I18, C25

Keywords: Maternal health, antenatal care, delivery assistance, models for binary data, Bolivia.

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1 Introduction

Bolivia is a Plurinational State, composed by different ethnicities. This feature and the historical background admit social differences among traditional and modern societies. Maternal health care is one of the topics that could admit those differences.

This research addresses the following question: Are cultural factors relevant for health services utilization in the case of maternal health care? The hypothesis is that maternal health attendance is strongly related to cultural factors.

The theoretical framework considers three groups of independent variables, those related to individual characteristics (Including cultural factors), those related to characteristics of the morbidity, and those related to the health system. Two dependent variables were used, antenatal health care and delivery assistance with a health professional. Since both dependent variables are dichotomous, a binary choice model is used to study the probabilities of attending formal services according to the theoretical framework. Methodology is consistent with the literature in this field.

Findings support the hypothesis, cultural factors are relevant for maternal health care utilization. However, individual characteristics have a stronger association. Maternal health care utilization is positively related to wealth, characteristics of morbidity and education and negatively associated with single mothers and cultural factors such as native women, west states and Aymara speakers. Although cultural factor were not measured directly, evidence supports the hypothesis.

The case of Bolivia is particularly interesting. Bolivia reduced its maternal and child mortality rates in the last decades however is still one of the countries with higher rates in Latin America. Different policies were implemented to promote maternal health care and reduce mortality rates such as a maternal free insurances and cash allowances, among other policies that intended to improve the health of mother and child. Bolivia also subscribed to the Millennium Development Goals, where 3 of 8 goals are strictly related to health improvements. A research in this field is highly useful to understand mechanisms of health and culture, and to evaluate the evolution of these goals considering the significant gap in research related to health in Bolivia.

The paper is organized as follows, section 2 presents some background data about situation in Bolivia to assess the relevance of the problem, a brief literature review of research related to maternal-child health is available in third section, section 4 presents a theoretical framework for maternal health care utilization, section 5 displays data, variables and methodology, section 6 shows the results and section 7 concludes.

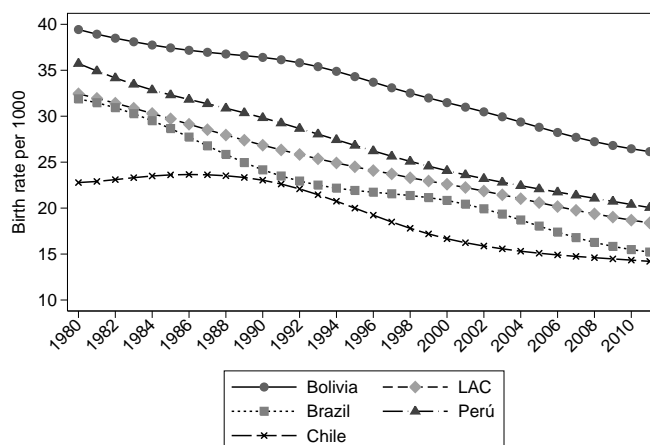
2 Relevance of the problem

Why is it important to study maternal health care in a country like Bolivia? As a developing economy Bolivia is still the country with the highest birth rate in South America, which is above the Latin America and Caribbean (LAC) average rate. According to World Bank data, in the 1960's decade Bolivia and Peru started with a similar birth rate however, Peru reduced its average rate along the years, in 2011 Peru birth rate was of 20 births per 1,000 people, while Bolivia had a rate of 26 births for every 1,000 people.

Figure 1 presents the evolution of birth rate from 1980 to 2010. The reduction of birth rate in Bolivia seems to be fluctuating slightly over the years, as Brazil and Chile rates, while the reduction of birth rate in Peru is straight, as the LAC average. A high birth rate could imply a higher risk for

mothers and newborns in a inappropriate health system.

Figure 1: Evolution of birth rate for selected countries



Source: The World Bank

Table 1 presents the maternal mortality ratio for the same countries. Maternal mortality is the ratio of women whom died during pregnancy or childbirth per 100,000 live births. Bolivia has the highest ratio, which is above two times the ratio of LAC countries average in 2010.

Table 1: Maternal mortality ratio for selected countries

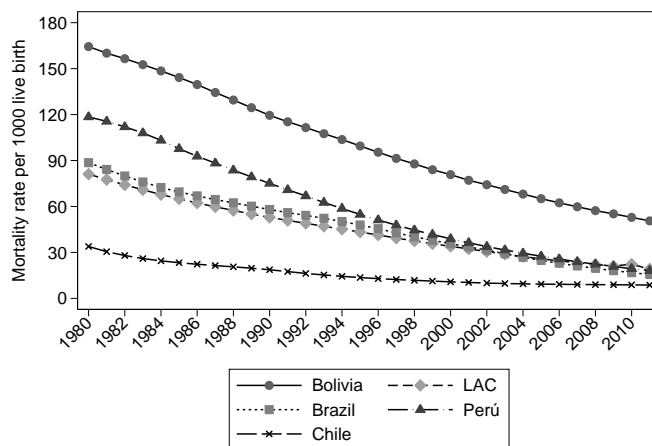
Year	Lac	Bolivia	Brazil	Chile	Peru
2000	110	280	81	29	120
2005	90	240	67	26	90
2010	82	190	56	25	67

Source: The World Bank

The case of child mortality is also high in Bolivia with 50 child dying before reaching 5 years old, when the LAC average is of 19 dead child before the age of 5. According to data, Bolivia had the smallest rate of reduction in child mortality from 1960 to 2011. There is no doubt that Bolivian child mortality rate is well above region average and falling slowly, while other countries child mortality rates seem to be converging to the LAC average.

These rates and ratios present an interesting fact, historically Bolivia had issues related to maternal health care and child and maternal mortality. Bolivia reduced its rates along the years but this reduction was smaller than other countries reduction. According to ECLAC (2006) the main issue for Bolivia in health is infant and maternal mortality, followed by chronic infections and undernourishment.

Figure 2: Evolution of child mortality rate for selected countries (Under the age of 5)



Source: The World Bank

Bolivian state implemented the maternal-child universal insurance (SUMI, for its acronym in Spanish) in 2002, this insurance consists of free health service for pregnant women since the beginning of gestation till six months after birth, and also to child until the age of 5. This insurance is valid and works in the National Health System and Short Run Social Security System¹.

One program was also implemented in 2009 the *Bono “Juana Azurduy”* which is a net cash allowance to promote access to health and reduce maternal mortality, child mortality and chronic undernourishment of child under two years. However, this program remains outside the analysis of this paper, since used data is of 2008 one year before the implementation of the allowance.

Furthermore, in 2009 Bolivia enacted a new Constitution which states that everyone has the right to health, and one of the purposes of the State is the guaranteed access to health services by protecting this right, promoting public policies and free access to the service.

Bolivia also subscribed to the Millennium Development Goals, where three of the eight goals are related to health improvements. The first health goal is to reduce child mortality (under 5 mortality rate) by two thirds between 1990 and 2015. The second one is to improve maternal health, by reducing three quarters the maternal mortality ratio for 2015 and achieving universal access to reproductive health. The third goal related to health is to combat HIV/AIDS, malaria and other diseases.

By this point, it is clear that Bolivian government recognized the importance of implementing health policies and enacting laws to promote the access to health, even though these policies couldn't address health issues totally.

3 Literature Review

Theoretical and applied research on health care social determinants took relevance in the decade of 1970, but earned an important role for public policy in the following decade. Two pathfinder theoretical frameworks were developed to study health seeking behaviour, the first one states that

¹The SUMI is the scaling up of two programs implemented in 1996 and 1998, respectively. There is some information of these programs in the following section

health services utilization depends on the health delivery system, individual determinants and societal determinants which include technology and social norms (Andersen & Newman, 1973). The other, propose a model for developing countries, combining anthropological and socio-medical approaches with a specific emphasis in epidemiological characteristics (Kroegeer, 1983). These two approaches are the most reliable source to understand health seeking behaviour theoretically. Although they were developed quite time ago they remain useful to study the behaviour towards health².

Empirical research on determinants of maternal health services utilization is a growing topic in developing countries. Considering its role over development issues, education is expected to have a positive correlation with the use of modern health facilities, in Peru for example, education was significant to explain the behaviour of mothers for health services use, nevertheless these effects were lower accounting other covariates (Elo, 1992). Similar results were found in a 22 developing countries study, where they evaluate the effects of maternal education on three child health outcomes, small coefficients were found, and only a few countries presented statistical significance (Desai & Alva, 1998). Other studies have focused in the role of a different set of covariates, Mekonnen & Mekonnen (2002) find significant differences between urban and rural mothers health care utilization in Ethiopia, explaining these differences through the higher knowledge spill overs and accessibility in urban areas, and arguing the persistence of traditional practices in rural mothers. The *need factor* or severity of the morbidity might be also a main determinant of health services utilization. Having a higher risk, or a dangerous morbidity can explain the utilization of maternal health care, Chakraborty, et al., (2003) find that this factor is the most important explaining maternal health care in Bangladesh.

The review is broader for health literature in Bolivia. Literature in topics related to health can contribute the understanding of some trends and specific determinants on maternal health behaviour, even if there is not a wide range of research related to maternal health utilization.

Empirical health research in Bolivia in some way is related to a set of implemented policies, in 1996 the Bolivian government created the Maternal Child National Insurance (SNMN, for its acronym in Spanish) aiming to reduce economic barriers to mothers and children. The SBS (Basic Health Insurance) replaced the SNMN in 1998, covering primary health services for mothers and newborns, as explained in the above section the SUMI was implemented in 2003 with the purpose of reducing maternal and child mortality. A impact evaluation of the SBS found that the insurance has no significance controlling for individual characteristics over the coverage of deliveries attended by trained personnel but gains significance introducing control variables for correlated demographic changes (Vidal, 2003). On the other hand, positive impact of the insurances was found, but only for women in a good economic position and with higher levels of education (UDAPE, 2006). These results present evidence of difficulties insurances faced to reach vulnerable households. Narvaez & Saric (2003) state that there are economic, cultural and educational barriers in Bolivia, making approximately two thirds of Bolivian population excluded of health services. Rural households also have lower accessibility to prenatal and birth attendances than urban households (Narvaez, 2002).

Bicego & Boerma (1990) find that maternal education has reduced the use of traditional services in rural areas, increasing the advantage of children of educated women, while in urban areas, education has little influence over child survival. In this urban-rural differences, migrants (from rural

²Some recent research use these theoretical frameworks: Elo (1992), Chakraborty et. al. (2003)

to urban) never adopt the patterns of urban residents in breastfeeding and use of health services, suggesting the persistence of traditional social and cultural barriers (Tam, 1994).

It is also plausible that culture to be a determinant of health care utilization, considering the distribution of population in Bolivia. In a research of anthropometric indicators of children, Morales et. al. (2004) finds that altitude and belonging to Quechua culture has influence in child health, more precisely in height and weight of the children. On the other hand, birthweight is not associated with anthropological or geographic factors (Delajara & Chávez, 2013).

The purpose of this document is to contribute in the knowledge of maternal health utilization in Bolivia. Particularly, to gather in the culture factor in the health seeking behaviour in these kind of countries with ethnic fragmentation.

4 Theoretical Framework

The approach of Kroeger (1983) is one of the most well accepted to model health seeking behaviour. This model states that health care utilization may begin with the morbidity perception, once the morbidity has been perceived, there are three categories that determine the utilization of health services:

- Predisposing factors
- Characteristics of illness
- Characteristics of the health care system

Predisposing factors are individual characteristics as age, ethnic group, years of education or marital status, among others. These variables are strictly related to individual and tangible attributes. There are cultural factors within the predisposing factors. Characteristics of illness are related to the expected benefits of being treated in formal services or, to put it in different words, to the severity of illness such that the utilization of medical service are a result of a unique alternative to take care of the illness. Characteristics of the health care system are related to the quality and attainability of the service, this vector could contain variables that measure price, access or a evaluation³.

Formally, the Kroeger model states:

$$u_i = u_i(m_i) \tag{1}$$

Where u_i is the utilization of the health care for individual i , and m_i is the perception of morbidities which will be different of 0 if individual i perceive it. A simplifying assumption is taken, $u_i = 0$ if $m_i = 0$, however it may not be a strong assumption in a developing country where preventive health programs still have a small impact over people, therefore individual i can attend a formal medical center only if she/he perceives a morbidity. When individual i has already perceived the morbidity, there are two possible outcomes:

$$u_i = \begin{cases} 0 & m_i \neq 0 | \sum x_j \\ 1 & m_i \neq 0 | \sum x_j \end{cases}$$

³This approach differs from Andersen & Newman (1973) which considers changes in medical technology and social norms related to the definition and treatment of illness

Where $j = 1, 2, 3$ are the predisposing factors. Then:

$$u_i = u_i(x_1, x_2, x_3) \quad (2)$$

As mentioned above, utilization of healthcare is function of x_1 , predisposing factors; x_2 , characteristics of illness and x_3 , characteristics of health care system. In this document I consider u_i with two different variables, utilization of antenatal health care in formal services and, utilization of delivery assistance with health professionals.

- Predisposing factors
 - Individual characteristics
 - Household characteristics
 - Cultural factors
- Characteristics of morbidity
- Characteristics of the health care system

This approach was used by Elo (1992) when studying the determinants of maternal health in Peru and a similar approach was used by Chakraborty et. al. (2003) who considered three set of covariates as in this approach.

5 Data & Methodology

5.1 DHS

The DHS, also known as ENDSA in Bolivia (for its acronym in Spanish) is the most accurate micro-data survey in health related issues available in Bolivia. This survey is planned to be realized between periods of approximately five years, the latest available survey was performed in 2008⁴.

This survey receives financial aid of international cooperation and technical assistance of Monitoring and Evaluation to Assess and use Results Demographic and Health surveys (MEASURE DHS) and is performed by the National Institute of Statistics (INE) and the Bolivian Health Bureau.

The sample covers 20,000 households and within each household a individual survey for women in the range of 15 and 49 years, on the other hand one of three households were selected for the individual men survey (15-64 years). Based on the 2001 census, the sampling frame of the ENDSA takes into account randomly 1,000 primary sampling units (of the 16,790), stratification was performed according population, dwellers over 2,000 people were considered as urban and the ones with less than 2,000 were considered rural households.

The DHS has information of antenatal health care of last mother birth within last five years. There is a record of number of visits, place and person who attended the woman for antenatal health care. For delivery assistance, there is information of the last six births within the last five years⁵. This

⁴The survey is also available for 1989, 1994, 1998 and 2003 and might be performed again in 2014.

⁵Although in the database, the upper bound is four births.

information also contains place and asks who assisted the birth. Since there are women with more than one birth in last five years, there is a problem when, for one child a mother has institutional delivery but for other do not, to overcome this issue mothers with all formal delivery assistance are considered consistent mothers, which means mothers that had all their child with formal assistance during last five years.

Although, some studies consider an auxiliary midwife as a non-trained professional to take care of a delivery (Bell, Curtis and Alayón, 2003), in this research they are included as professionals, since this data may be biased due to the difficulties in recognizing a health professional by its precise position, which could bring underestimated results.

5.2 Variables selection

Variables were selected based on the theoretical framework, however there is a *ad hoc* inclusion of variables to reach the aim of the research.

Predisposing factors can be divided in household, individual and cultural characteristics. Individual characteristics are age, years of education and marital status, however to stress this last variable a dummy for single mother is used expecting a rough indicator.

Wealth, number of children under 5 years old in the household and having family background of maternal mortality (Maternal mortality proxy) are considered as household characteristics. The maternal mortality proxy was constructed based on the story of dead siblings (Dead sisters during pregnancy, delivery or post delivery). The DHS use the siblings approach to estimate maternal mortality in a ten year range, they emphasize the indicator is not accurate considering that maternal mortality is a strange phenomena. Nonetheless, this approach is used to approximate maternal mortality following the assumption that families have a higher probability of gathering the same background (economic, cultural, habits). This variable could address something more than a household characteristic, it can be also understood as a cultural characteristics. A negative association of that variable with health care could explain that women can not break through the cultural barrier, on the other hand a positive association could explain that women can learn from their family background and break through the culture barrier.⁶

Since this document aim is to find significant differences in health care due to cultural factors, first is important to explain how the approximation of cultural factors is going to be performed, culture refers to particular characteristics that some groups share as the language, habits and social behaviour towards different situations among others. Cultural characteristics will be measured directly through first learned language, self-identification as native, state of residence and childhood place of residence.

Two variables were considered for characteristics of morbidity. Reported problems during pregnancy is used when the dependent variable is antenatal health care, while when the dependent variable is delivery assistance, there are two variables, reported problems during pregnancy and having attended antenatal health care.

As characteristics of the health system were considered a categorical variable that contains the number of health facilities in the municipality and residence area (urban or rural), there might be differences in number of facilities according to number of dwellers.

⁶It is quite important no to forget that maternal mortality is a strange phenomena and results could be non significant due to number of observations

Robustness analysis is performed to reduce bias through variables correlation. By this moment it is important to consider bias through omitted variables. A omitted variable is the proximity of the house to a health facility, the inclusion of that variable could improve calculations and reduce the effects of other variables as wealth for example, or some others that could be related, another omitted variable is the holding of a private health insurance. Of course household income, however there is not available data for that in the DHS and method to do imputations present bias and do not rely confidence. Also some variable that could assess the quality of health services and the perception of the mother of those services.

Descriptive statistics of the dependent variables and covariates are presented in tables 2 and 3.

Table 2: Descriptive Statistics for continuous and binomial variables

	Mean	Sd	Min	Max	Median
Prenatal care	0.91	0.28	0	1	1
Delivery care	0.65	0.48	0	1	1
Age	29.03	7.36	15	49	28
Years of education	7.89	4.79	0	17	8
Single mother	0.14	0.35	0	1	0
Number of child under 5	1.48	0.75	0	6	1
Mortality background	0.01	0.10	0	1	0
Native	0.57	0.50	0	1	1
Issues	0.25	0.43	0	1	0
Rural area	0.45	0.50	0	1	0

Table 3: Descriptive statistics for categorical variables

	Freq.	Percent	Cum.
Wealth			
Poorest	1,606	24.98	24.98
Poorer	1,324	20.59	45.57
Middle	1,348	20.97	66.54
Richer	1,204	18.73	85.27
Richest	947	14.73	100
Total	6,429	100	
Language			
Spanish	3,849	59.91	59.91
Quechua	1,702	26.49	86.4
Ayamara	739	11.5	97.9
Guarani	67	1.04	98.94
Other native	48	0.75	99.69
Foreign	20	0.31	100
Total	6,425	100	
State			
Chuquisaca	577	8.97	8.97
La Paz	1,143	17.78	26.75
Cochabamba	877	13.64	40.4
Oruro	550	8.55	48.95
Potosí	765	11.9	60.85
Tarija	536	8.34	69.19
Santa Cruz	1,202	18.7	87.88
Beni	458	7.12	95.01
Pando	321	4.99	100
Total	6,429	100	
Childhood place of residence			
Capital, large city	1,725	26.84	26.84
City	659	10.25	37.09
Town	1,570	24.43	61.52
Countryside	2,424	37.72	99.24
Abroad	49	0.76	100
Total	6,427	100	
Number of health facilities			
Municipality. - 5 Health facilities	722	11.23	11.23
Municipality. 6-10 Health facilities	1,489	23.16	34.39
Municipality. 11-20 Health facilities	1,239	19.27	53.66
Municipality. 20-50 Health facilities	1,328	20.66	74.32
Municipality. 50 + Health facilities	1,651	25.68	100
Total	6,429	100	

5.3 Models for binary data

Maternal health care utilization can be expressed as a dichotomous variable, which takes the value of 1 if the woman was attended by a health professional for antenatal health care and 0 otherwise. For delivery assistance, the variable is 1 if woman received formal assistance and 0 otherwise. The survey provides a categorical classification of the kind of help the mother looked for, either prenatal health care utilization or delivery assistance.

$$u_i = \begin{cases} 1 & \text{if woman } i \text{ received formal maternal health care} \\ 0 & \text{otherwise} \end{cases}$$

Utilization of maternal formal services depend on a group of covariates, defined above in the theoretical framework:

$$u_i = x_i\beta \quad (3)$$

which can also be written as:

$$u_i = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \varepsilon_i \quad (4)$$

Where β_i are the intercept and estimators respectively, X_1 are the predisposing factors, X_2 are the characteristics of illness, and X_3 are characteristics of the health care system.

In this case, pregnancy can be considered a morbidity, since it is a situation outside women regular healthy life, for which women ought to take some special care. Since the Linear Probability Model has a couple of disadvantages for the estimation of a binary response model, the logistic function is used:

$$u_i = \frac{\exp^{x_i\beta}}{1 + \exp^{x_i\beta}} = \Lambda(u) \quad (5)$$

The probability of utilization of maternal health care for woman i is a non-linear function of covariates X_i . Because of the nature of this kind of functions the approach is the Maximum Likelihood estimation.

The sign of the coefficient in the logit model shows the direction that each variable takes, displaying a positive or negative association. Average Marginal Effects (AMEs) are used to estimate the degree of that association, considering that using marginal effects at means could bring inefficient estimators with dichotomous data, where a mean between 0 and 1 would be undesirable.

6 Results

Table 4 displays the results of the logit estimation for maternal health care utilization and their marginal effects.

The aim of the document is to estimate the statistical association between maternal health care and variables related to culture however, additional control variables are considered according to the theoretical framework, therefore more variable associations can be inferred.

Columns (1) and (3) present the results of the logit estimation when the dependent variable is antenatal health care and formal delivery assistance, respectively. It is important to see in these two columns if the values displayed are positive or negative, in order to understand a positive or negative association with the dependent variable. To assess the association degree refer to marginal

effects in columns (2) and (4).

The wealth covariate has the strongest association with health care. This means that while wealth level is higher the probability of attending a formal health service increases. On the other hand, the state covariate shows that states in the Andean region (La Paz, Oruro and Potosi) present a smaller probability of using health services (with relation to the capital state). Those women who identified themselves as native have a negative probability of using health services in relation to those that are no-native, however this difference is not greater than 4 percent points.

Characteristics of morbidity are important, both covariates related to severity are positively related with the use of formal health services. This finding reinforces the set up of the theoretical framework, severity issues shove the need factor which is positively related with the use of modern health services.

Characteristics of the health system are not that significant, and as you will see later, results in this field are not that stable. A robustness analysis is useful, mainly in consideration of possible flaws of *ad hoc* components included in the model, the uncertainty of the specification and possible bias caused by data. Robustness helps to assess stability of inferences (Plümper & Neumayer, 2013).

Three different estimations are performed to assess the reliability and stability of the original model. The first robustness model excludes correlated variables. Table 5 presents the correlation matrix of all covariates. Since not all covariates are continuous, in fact most are dichotomous and categorical, a *polychoric* correlation matrix is estimated. Education is positively correlated with wealth. Both education and wealth, are negatively correlated with place of residence as a child and area of residence (rural). As expected language is highly correlated with native self-identification. Finally, the number of municipality health facilities has a important correlation with area of residence.

The second robustness model uses alternative variables to rate the reliability of the data. This second specification replaces age with age squared, replaces years of education with attained level of education and excludes the language variable to check for shifts in the native covariate.

The third model of robustness analysis uses the less amount of variables that could explain the theoretical framework. This represents almost one variable for each vector of covariates. Level of education as an approximation of individual characteristics, number of child under 5 years old as a household characteristic, language as a proxy of cultural factors, issues during pregnancy as severity of the morbidity (antenatal care is the covariate for the second dependent variable) and area as the covariate that represents differences in health system.

The original model can be considered quite stable. Significance on main variables do not change in the three robustness models. Tables 6 and 7 present the estimations and marginal effects of robustness specifications.

For the specification of antenatal health care, self identification as native remains significant, so do *Aymara* speakers. *Quechua* speakers gain significance with the specification 1 as well as inhabitants of Santa Cruz. The number of health facilities loses significance for alternative specifications, making of it a unreliable variable for antenatal health care.

The second model, where the dependent variable is delivery assistance, presents uncertainty on health system covariates, the number of health facilities and the rural area variable. States of Tarija and Santa Cruz gain some significance in specification 1 and 2, respectively. *Quechua* and other native languages speakers also get significance on alternative specifications.

Regardless of uncertainty with characteristics of the health system, which are not foolish shifts, there is robustness on most covariates. Predisposing factors an characteristics of morbidity are in

Table 4: Results of the logistic regression for both dependent variables

	(1)		(2)		(3)		(4)	
	Antenatal care				Delivery assistance			
	Logit	Marginal Effects	Logit	Marginal Effects	Logit	Marginal Effects	Logit	Marginal Effects
Age	-0.008 (0.008)	-0.001 (0.001)	0.006 (0.006)	0.001 (0.001)	0.006 (0.006)	0.001 (0.001)	0.006 (0.006)	0.001 (0.001)
Years of education	0.126*** (0.018)	0.010*** (0.001)	0.090*** (0.012)	0.013*** (0.002)	0.090*** (0.012)	0.013*** (0.002)	0.090*** (0.012)	0.013*** (0.002)
Poorer	0.536*** (0.146)	0.042*** (0.011)	0.742*** (0.110)	0.108*** (0.016)	0.742*** (0.110)	0.108*** (0.016)	0.742*** (0.110)	0.108*** (0.016)
Middle	0.985*** (0.247)	0.077*** (0.019)	1.141*** (0.154)	0.166*** (0.022)	1.141*** (0.154)	0.166*** (0.022)	1.141*** (0.154)	0.166*** (0.022)
Richer	1.220*** (0.296)	0.095*** (0.023)	1.606*** (0.186)	0.234*** (0.026)	1.606*** (0.186)	0.234*** (0.026)	1.606*** (0.186)	0.234*** (0.026)
Richest	0.871* (0.365)	0.068* (0.029)	1.799*** (0.249)	0.262*** (0.035)	1.799*** (0.249)	0.262*** (0.035)	1.799*** (0.249)	0.262*** (0.035)
Single mother	-0.815*** (0.149)	-0.064*** (0.012)	0.408** (0.127)	0.060** (0.018)	0.408** (0.127)	0.060** (0.018)	0.408** (0.127)	0.060** (0.018)
# Child in household under 5	-0.018 (0.071)	-0.001 (0.006)	-0.762*** (0.059)	-0.111*** (0.008)	-0.762*** (0.059)	-0.111*** (0.008)	-0.762*** (0.059)	-0.111*** (0.008)
Background maternal mortality	-0.473 (0.360)	-0.037 (0.028)	0.250 (0.533)	0.036 (0.078)	0.250 (0.533)	0.036 (0.078)	0.250 (0.533)	0.036 (0.078)
Quechua	0.037 (0.210)	0.003 (0.016)	-0.087 (0.122)	-0.013 (0.018)	-0.087 (0.122)	-0.013 (0.018)	-0.087 (0.122)	-0.013 (0.018)
Aymara	-0.560** (0.193)	-0.044** (0.015)	-0.353* (0.152)	-0.051* (0.022)	-0.353* (0.152)	-0.051* (0.022)	-0.353* (0.152)	-0.051* (0.022)
Guarani	0.115 (0.589)	0.009 (0.046)	0.225 (0.340)	0.033 (0.050)	0.225 (0.340)	0.033 (0.050)	0.225 (0.340)	0.033 (0.050)
Other native language	0.812 (0.598)	0.064 (0.047)	-0.345 (0.463)	-0.050 (0.068)	-0.345 (0.463)	-0.050 (0.068)	-0.345 (0.463)	-0.050 (0.068)
Foreign language	(omitted)	(omitted)	2.720** (1.046)	0.396** (0.153)	2.720** (1.046)	0.396** (0.153)	2.720** (1.046)	0.396** (0.153)
Native (Self identification)	-0.487** (0.173)	-0.038** (0.014)	-0.272** (0.105)	-0.040** (0.015)	-0.272** (0.105)	-0.040** (0.015)	-0.272** (0.105)	-0.040** (0.015)
La Paz	-1.400*** (0.261)	-0.110*** (0.021)	-0.736*** (0.176)	-0.107*** (0.026)	-0.736*** (0.176)	-0.107*** (0.026)	-0.736*** (0.176)	-0.107*** (0.026)
Cochabamba	-1.075*** (0.244)	-0.084*** (0.020)	-0.386* (0.154)	-0.056* (0.022)	-0.386* (0.154)	-0.056* (0.022)	-0.386* (0.154)	-0.056* (0.022)
Oruro	-1.087*** (0.297)	-0.085*** (0.023)	-0.937*** (0.193)	-0.137*** (0.028)	-0.937*** (0.193)	-0.137*** (0.028)	-0.937*** (0.193)	-0.137*** (0.028)
Potosi	-0.595* (0.256)	-0.047* (0.020)	-0.944*** (0.167)	-0.138*** (0.024)	-0.944*** (0.167)	-0.138*** (0.024)	-0.944*** (0.167)	-0.138*** (0.024)
Tarija	-0.581 (0.371)	-0.046 (0.029)	0.138 (0.202)	0.020 (0.029)	0.138 (0.202)	0.020 (0.029)	0.138 (0.202)	0.020 (0.029)
Santa Cruz	-0.609* (0.290)	-0.048* (0.023)	-0.074 (0.172)	-0.011 (0.025)	-0.074 (0.172)	-0.011 (0.025)	-0.074 (0.172)	-0.011 (0.025)
Beni	-1.280*** (0.349)	-0.100*** (0.027)	0.034 (0.225)	0.005 (0.033)	0.034 (0.225)	0.005 (0.033)	0.034 (0.225)	0.005 (0.033)
Pando	-0.097 (0.547)	-0.008 (0.043)	-0.087 (0.262)	-0.013 (0.038)	-0.087 (0.262)	-0.013 (0.038)	-0.087 (0.262)	-0.013 (0.038)
Childhood resid. City	0.130 (0.293)	0.010 (0.023)	0.109 (0.177)	0.016 (0.026)	0.109 (0.177)	0.016 (0.026)	0.109 (0.177)	0.016 (0.026)
Childhood resid. Town	0.105 (0.217)	0.008 (0.017)	-0.028 (0.144)	-0.004 (0.021)	-0.028 (0.144)	-0.004 (0.021)	-0.028 (0.144)	-0.004 (0.021)
Childhood resid. Countryside	0.018 (0.224)	0.001 (0.018)	-0.317* (0.147)	-0.046* (0.021)	-0.317* (0.147)	-0.046* (0.021)	-0.317* (0.147)	-0.046* (0.021)
Childhood resid. Abroad	0.834 (1.059)	0.065 (0.083)	0.163 (0.620)	0.024 (0.090)	0.163 (0.620)	0.024 (0.090)	0.163 (0.620)	0.024 (0.090)
Health issue in pregnancy	0.451** (0.151)	0.035** (0.012)	0.176 (0.096)	0.026 (0.014)	0.176 (0.096)	0.026 (0.014)	0.176 (0.096)	0.026 (0.014)
Antenatal care			1.467*** (0.143)	0.214*** (0.020)	1.467*** (0.143)	0.214*** (0.020)	1.467*** (0.143)	0.214*** (0.020)
Municipality. 6-10 Health facilities	-0.098 (0.187)	-0.008 (0.015)	0.142 (0.143)	0.021 (0.021)	0.142 (0.143)	0.021 (0.021)	0.142 (0.143)	0.021 (0.021)
Municipality. 11-20 Health facilities	-0.411 (0.214)	-0.032 (0.017)	-0.084 (0.157)	-0.012 (0.023)	-0.084 (0.157)	-0.012 (0.023)	-0.084 (0.157)	-0.012 (0.023)
Municipality. 20-50 Health facilities	-0.200 (0.218)	-0.016 (0.017)	0.153 (0.159)	0.022 (0.023)	0.153 (0.159)	0.022 (0.023)	0.153 (0.159)	0.022 (0.023)
Municipality. 50 + Health facilities	-0.865*** (0.255)	-0.068*** (0.020)	0.121 (0.188)	0.018 (0.027)	0.121 (0.188)	0.018 (0.027)	0.121 (0.188)	0.018 (0.027)
Rural area	-0.552* (0.228)	-0.043* (0.018)	-0.160 (0.144)	-0.023 (0.021)	-0.160 (0.144)	-0.023 (0.021)	-0.160 (0.144)	-0.023 (0.021)
Cons.	3.296*** (0.538)		-0.596 (0.395)		-0.596 (0.395)		-0.596 (0.395)	
N	6397		6417		6417		6417	
Pseudo - R^2	0.172		0.315		0.315		0.315	

Standard errors in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Note: (omitted) because predicts success perfectly

general stable covariates. The pseudo R^2 supports the original specification, even when this indicator could be biased by the number of covariates.

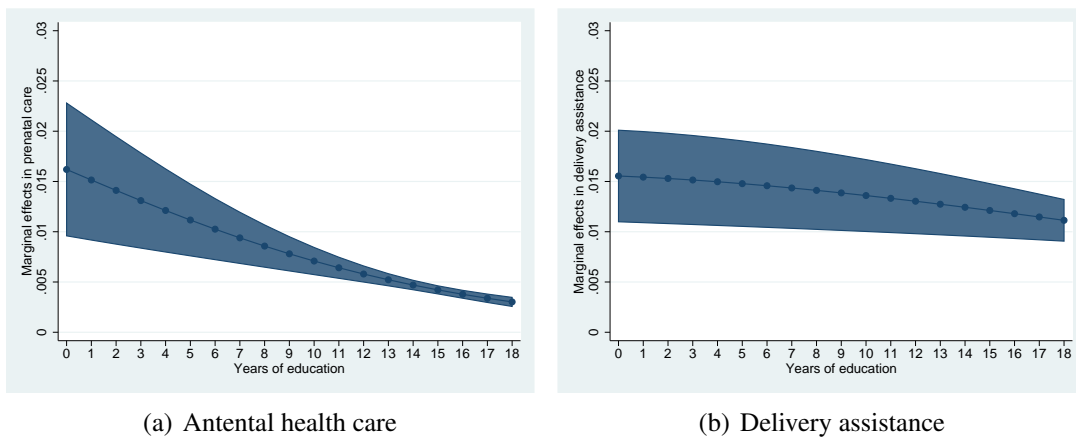
After the robust analysis it is quite important to look at the findings and their implications. Findings are consistent with the hypothesis, cultural covariates are associated with health care. Native

women, *Aymara* speaker women and mainly, women of La Paz, Cochabamba, Oruro and Potosi have smaller probabilities of attending health services. Even if these results support the hypothesis, there are other covariates with higher significances, as wealth and education, a fact that restricts the scope of the findings.

As a tool to understand the dynamics of covariates, average marginal effects are displayed as figures below.

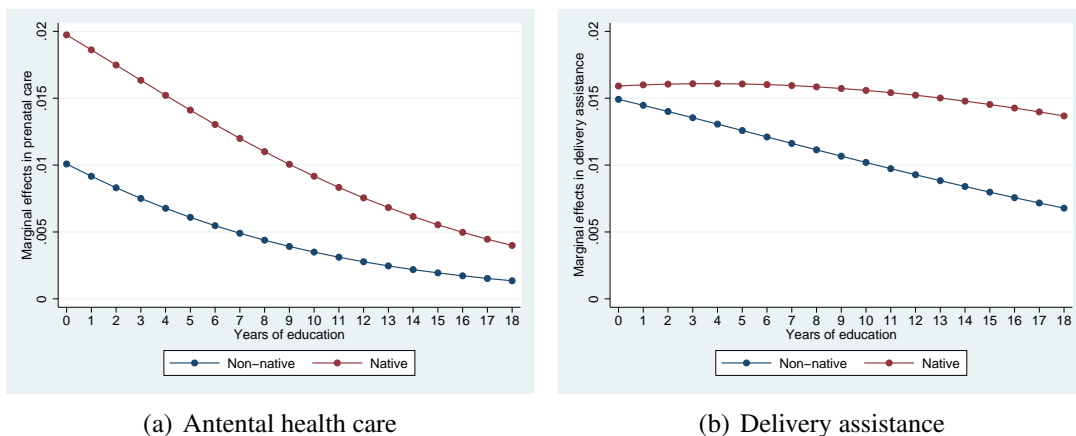
Figure 3 shows the average marginal effect of education for both dependent variables. Marginal effects of an additional year of education are small and decreasing but always positive. An additional year of education is more significant for the use of delivery assistance than for antenatal care, where at some point the addition of a schooling year increases the probabilities in a value not far from zero.

Figure 3: Average Marginal Effects of Education



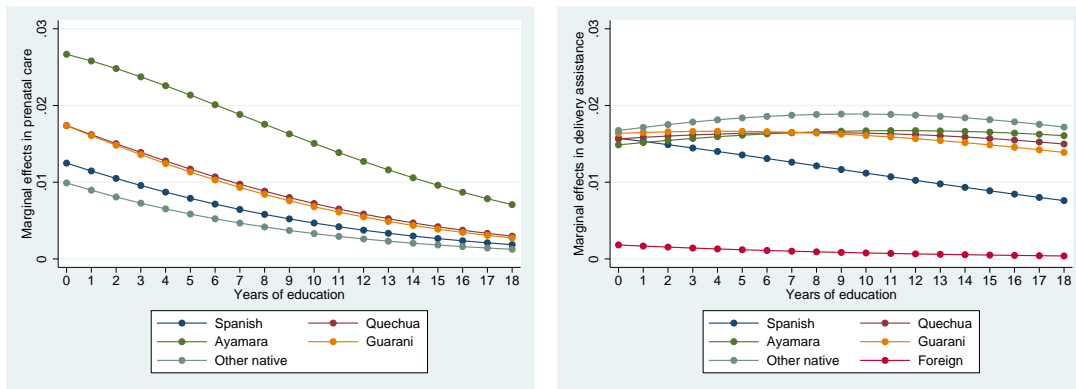
Results are even more interesting decomposing the marginal effect of education by self identification. Those women that are native have greater marginal effects than those who are not. This means that an additional year of education for a native mother increases the probability of attending health services more than for a non-native mother.

Figure 4: Average Marginal Effects of Education by self identification



Decomposing the results by language (native tongue), it is evident that education has higher marginal effects for *Aymara* speakers, followed by *Quechua* and *Guarani* speakers. When the dependent variable is delivery assistance there are no significant differences among those who speak a native tongue, but Spanish speakers have decreasing marginal effects with the evolution of years of education, while the marginal effects of those who speak foreign languages are near zero. This implies that those mothers that speak *Aymara* are in disadvantage related to those mothers who speak other languages.

Figure 5: Average Marginal Effects of Education by native tongue

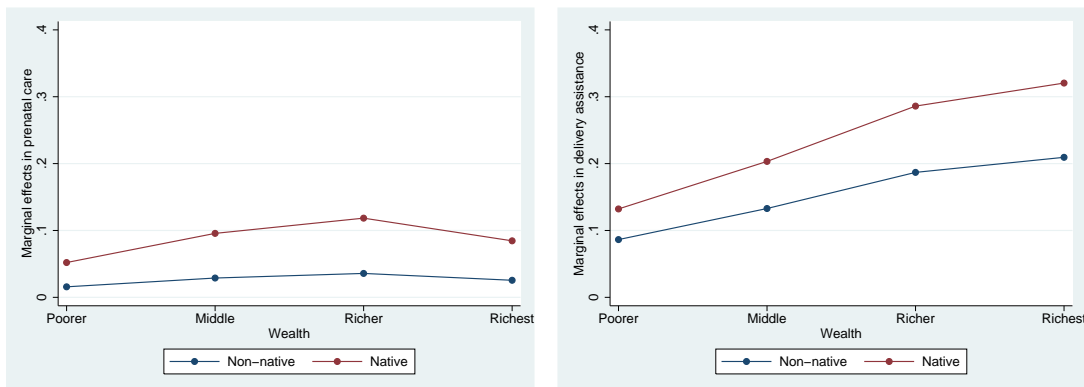


(a) Antental health care

(b) Delivery assistance

Wealth is also a significant covariate. In fact, the significance of wealth is higher than the significance of education. Once again the average marginal effects of a improvement in the wealth indicator is higher for those considered native, this means that any climbing in the wealth scale for a native improves his probabilities of using health services more than a non-native mother.

Figure 6: Average Marginal Effects of Wealth by self identification



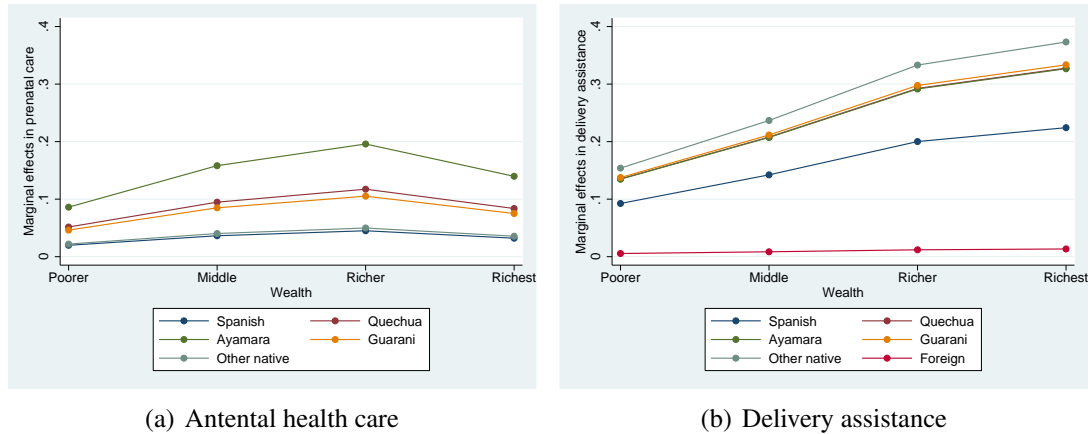
(a) Antental health care

(b) Delivery assistance

Native speakers also improve their probabilities in a higher proportion than Spanish speakers and foreign languages speakers, when they upgrade their wealth. Changes in wealth condition can

improve significantly the probability of receiving assistance in formal health services for antenatal care and for delivery.

Figure 7: Average Marginal Effects of Wealth by native tongue



The differences in the marginal effects among native and non-native imply that there are differences in the utilization of health services, that is why an additional year has more importance for a native. To put it in different words, if marginal effects were the same, there wouldn't be differences in the probabilities of using health services between the two groups. Native women have a lower accessibility to health services.

Another important implication is that an improvement in wealth could do more than a few years of education. Moving from *the poorest* to *poorer* has a higher impact than one or even three years of education, and this effect is higher when moving to categories in the wealth index. Education has a lower impact than proxies of income, so improvements in wealth could do more as a short term policy than education (Ruling out the fact that these variables are correlated). Following this implication, policies implemented in Bolivia, specifically the cash transfer “Bono Juana Azurduy” could have higher impacts on health attendance than education-information policies such as those implemented in Peru (“Familias Saludables”).

Policies towards native people with emphasis on Aymara speakers could have a important impact on health care utilization. It may be important to consider states as La Paz, Cochabamba, Oruro and Potosi, with emphasis in municipalities with less health facilities. Focusing policies to single mothers could improve health care utilization, and could reduce costs associated to universalized insurances, as Valdivia (2011) states in a research study guided for Peru.

This set of policies could narrow the existing gaps inside Bolivian society and specially among women. However, it is also important to consider individual characteristics that constitute social factors, according to Valdivia (2010) women (people in general) suit the lifestyle of cities when they move in. Culture could be more permeable than individual characteristics as income or education.

7 Conclusions

This paper addresses one of the most relegated issues in social science research in Bolivia, the association of culture and maternal health care. The findings have a high value for current policy evaluation and for further public policy implementation.

The methodology to estimate the association of cultural factors and maternal health care utilization is a logit model, based on three sets of covariates, predisposing factors (which incorporate cultural covariates), characteristics of morbidity and characteristics of health system. To assess maternal health care utilization, two dependent variables were considered, one variable for antenatal health care and a second for delivery assistance with a health professional. Average Marginal Effects are used to avoid difficulties due to calculations at means. A robust analysis is performed to overcome possible uncertainty and bias in the model.

Individual characteristics and cultural factors are highly related with both dependent variables. West states (La Paz, Oruro, Cochabamba and Potosi) have negative AME compared to other states. These states present higher rates of native population, supporting the hypothesis of cultural barriers. Women self identified as native also present a negative probability of attending formal health care, as well as *Aymara* speaker women. Characteristics of morbidity play an important role, when there are health problems and medical service seem to be the only alternative. Characteristics of the health system present insignificant variables, possibly due to lack of adequate data.

Cultural factors are negatively related to health care utilization, however there are corresponding individual characteristics with higher significances as wealth or education. Although, these research has evidence of inequalities in health utilization, explained through the differences in marginal effects among native and non-native people. Short run policies should focus on improving wealth condition rather than education, since a simple improvement in wealth is higher than a improvement in at least three years of education. Another recommended policy to improve maternal health attendance for delivery assistance is to improve antenatal care, considering the average marginal effects.

There might be some bias in the results since this document is attempting to measure the influence of modern services among people that theoretically keep their culture, including their appeal to health services and beliefs about health.

Limitations of this paper are high, there are at least two improvements for this research. The first one is intend to address causality, and the second is to find variables that could improve calculations as geo-reference data, which is available in the DHS and should be available for health facilities. Another difficulty related to the data is that the DHS are performed approximately every five years, so indicators are not precisely constructed for one year but for a interval of years.

Results of this research ought to open a debate on how to improve health utilization for specific groups of people who are relegated of the health system.

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A Tables

Table 5: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Age	1														
(2) Years of education	-0.19	1													
(3) Wealth index	-0.01	0.61	1												
(4) Single mother	-0.34	0.18	0.04	1											
(5) # Child in household under 5	-0.02	-0.20	-0.22	-0.10	1										
(6) Native	0.17	-0.28	-0.30	-0.10	0.05	1									
(7) Background maternal mortality	0.23	-0.15	-0.16	-0.14	-0.01	0.19	1								
(8) Language	0.16	-0.48	-0.44	-0.17	0.12	0.67	0.15	1							
(9) Municipality health facilities	0.00	0.27	0.55	0.05	-0.13	-0.09	-0.12	-0.19	1						
(10) Young mother	-0.33	-0.30	-0.27	0.05	0.11	-0.13	0.00	-0.01	-0.21	1					
(11) Residence place as child	0.09	-0.53	-0.57	-0.10	0.15	0.28	0.08	0.47	-0.36	0.14	1				
(12) Rural	0.05	-0.53	-0.91	-0.07	0.19	0.29	0.10	0.41	-0.73	0.22	0.63	1			
(13) Health issues in pregnancy	0.06	0.07	0.10	-0.01	-0.05	-0.03	0.12	-0.08	0.07	-0.01	-0.09	-0.09	1		
(14) Antenatal care	-0.13	0.38	0.35	-0.12	-0.07	-0.36	-0.16	-0.35	0.14	-0.05	-0.25	-0.32	0.15	1	
(15) State	-0.08	0.10	0.03	0.00	0.01	-0.44	0.04	-0.34	-0.22	0.19	-0.10	-0.06	0.01	0.16	1

Table 6: Robustness analysis for antenatal health care

	(1)	(2)	(3)	(4)	(5)	(6)
	Specification 1	Mg. Eff.	Specification 2	Mg. Eff.	Specification 3	Mg. Eff.
Age	-0.008 (0.008)	-0.001 (0.001)				
Age ²			-0.000* (0.000)	-0.000* (0.000)		
Years of education	0.152*** (0.016)	0.012*** (0.001)				
Incomplete elementary school			0.897*** (0.169)	0.072*** (0.014)	0.916*** (0.159)	0.075*** (0.013)
Complete elementary school			0.905*** (0.264)	0.073*** (0.021)	0.912*** (0.256)	0.074*** (0.021)
Incomplete high school			1.487*** (0.235)	0.120*** (0.019)	1.294*** (0.223)	0.106*** (0.018)
Complete high school			2.150*** (0.258)	0.173*** (0.021)	1.739*** (0.255)	0.142*** (0.021)
Higher education			3.009*** (0.374)	0.243*** (0.030)	2.534*** (0.385)	0.207*** (0.032)
Single mother	-0.881*** (0.150)	-0.071*** (0.012)	-0.823*** (0.148)	-0.066*** (0.012)		
# Child in household under 5	-0.058 (0.071)	-0.005 (0.006)	-0.085 (0.071)	-0.007 (0.006)	-0.002 (0.071)	-0.000 (0.006)
Native (Self identification)			-0.672*** (0.147)	-0.054*** (0.012)		
Quechua	-0.370* (0.174)	-0.030* (0.014)			-0.208 (0.139)	-0.017 (0.011)
Aymara	-0.766*** (0.172)	-0.061*** (0.014)			-1.228*** (0.142)	-0.100*** (0.012)
Guarani	-0.699 (0.567)	-0.056 (0.045)			-0.104 (0.560)	-0.009 (0.046)
Other native language	0.039 (0.548)	0.003 (0.044)			0.722 (0.524)	0.059 (0.043)
Foreign language	(omitted)	(omitted)			(omitted)	(omitted)
Background maternal mortality	-0.492 (0.389)	-0.040 (0.031)	-0.511 (0.385)	-0.041 (0.031)		
La Paz	-1.447*** (0.252)	-0.116*** (0.021)	-1.614*** (0.232)	-0.130*** (0.019)		
Cochabamba	-0.903*** (0.241)	-0.072*** (0.020)	-0.948*** (0.245)	-0.076*** (0.020)		
Oruro	-0.936*** (0.284)	-0.075** (0.023)	-1.026*** (0.277)	-0.083*** (0.022)		
Potosi	-0.650* (0.255)	-0.052* (0.021)	-0.645* (0.260)	-0.052* (0.021)		
Tarija	-0.245 (0.351)	-0.020 (0.028)	-0.453 (0.369)	-0.037 (0.030)		
Santa Cruz	-0.300 (0.280)	-0.024 (0.023)	-0.389 (0.279)	-0.031 (0.023)		
Beni	-0.864** (0.326)	-0.069** (0.026)	-0.900** (0.330)	-0.073** (0.027)		
Pando	0.278 (0.528)	0.022 (0.042)	0.194 (0.526)	0.016 (0.042)		
Health issue in pregnancy	0.456** (0.150)	0.037** (0.012)	0.460** (0.147)	0.037** (0.012)	0.424** (0.148)	0.035** (0.012)
Municipality. 6-10 Health facilities	-0.063 (0.189)	-0.005 (0.015)	-0.091 (0.186)	-0.007 (0.015)		
Municipality. 11-20 Health facilities	-0.246 (0.209)	-0.020 (0.017)	-0.242 (0.207)	-0.020 (0.017)		
Municipality. 20-50 Health facilities	0.056 (0.216)	0.004 (0.017)	0.131 (0.213)	0.011 (0.017)		
Municipality. 50 + Health facilities	0.206 (0.208)	0.017 (0.017)	0.244 (0.207)	0.020 (0.017)		
Rural area					-0.787*** (0.120)	-0.064*** (0.010)
Cons.	2.841*** (0.435)		2.964*** (0.378)		1.846*** (0.223)	
N	6405		6422		6405	
Pseudo - R ²	0.144		0.143		0.127	

Standard errors in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Note: (omitted) because predicts success perfectly

Table 7: Robustness analysis for delivery assistance

	(1)	(2)	(3)	(4)	(5)	(6)
	Specification 1	Mg. Eff.	Specification 2	Mg. Eff.	Specification 3	Mg. Eff.
Age	0.012*	0.002*				
	(0.005)	(0.001)				
Age ²			0.000	0.000		
			(0.000)	(0.000)		
Years of education	0.142***	0.022***				
	(0.010)	(0.002)				
Incomplete elementary school			0.428**	0.067**	0.382*	0.060*
			(0.160)	(0.025)	(0.156)	(0.024)
Complete elementary school			1.087***	0.170***	0.945***	0.148***
			(0.209)	(0.033)	(0.204)	(0.032)
Incomplete high school			1.187***	0.186***	0.969***	0.152***
			(0.194)	(0.030)	(0.190)	(0.030)
Complete high school			1.762***	0.276***	1.284***	0.201***
			(0.192)	(0.029)	(0.191)	(0.030)
Higher education			2.342***	0.367***	1.787***	0.280***
			(0.217)	(0.033)	(0.223)	(0.035)
Single mother	0.320**	0.049**	0.340**	0.053**		
	(0.120)	(0.019)	(0.120)	(0.019)		
# Child in household under 5	-0.778***	-0.120***	-0.782***	-0.123***	-0.756***	-0.118***
	(0.056)	(0.008)	(0.055)	(0.008)	(0.056)	(0.008)
Native (Self identification)			-0.572***	-0.090***		
			(0.096)	(0.015)		
Quechua	-0.516***	-0.080***			-0.588***	-0.092***
	(0.107)	(0.016)			(0.091)	(0.014)
Aymara	-0.658***	-0.102***			-1.039***	-0.163***
	(0.143)	(0.022)			(0.120)	(0.018)
Guarani	-0.584	-0.090			-0.088	-0.014
	(0.366)	(0.057)			(0.312)	(0.049)
Other native language	-0.868*	-0.134*			-0.576	-0.090
	(0.418)	(0.065)			(0.441)	(0.069)
Foreign language	3.285**	0.508**			3.166**	0.496**
	(1.101)	(0.171)			(1.055)	(0.166)
Background maternal mortality	0.212	0.033	0.221	0.035		
	(0.469)	(0.073)	(0.443)	(0.070)		
La Paz	-0.651***	-0.101***	-0.547***	-0.086***		
	(0.167)	(0.026)	(0.148)	(0.023)		
Cochabamba	-0.040	-0.006	-0.022	-0.003		
	(0.145)	(0.022)	(0.144)	(0.023)		
Oruro	-0.655***	-0.101***	-0.556**	-0.087**		
	(0.178)	(0.028)	(0.171)	(0.027)		
Potosi	-0.875***	-0.135***	-0.830***	-0.130***		
	(0.158)	(0.024)	(0.158)	(0.025)		
Tarija	0.399*	0.062*	0.412*	0.065*		
	(0.190)	(0.029)	(0.185)	(0.029)		
Santa Cruz	0.255	0.039	0.332*	0.052*		
	(0.164)	(0.025)	(0.159)	(0.025)		
Beni	0.270	0.042	0.381	0.060		
	(0.204)	(0.032)	(0.199)	(0.031)		
Pando	0.182	0.028	0.327	0.051		
	(0.245)	(0.038)	(0.243)	(0.038)		
Health issue in pregnancy	0.204*	0.032*				
	(0.092)	(0.014)				
Antenatal care	1.626***	0.252***	1.677***	0.263***	1.568***	0.246***
	(0.140)	(0.021)	(0.141)	(0.021)	(0.140)	(0.021)
Municipality. 6-10 Health facilities	0.210	0.033	0.181	0.028		
	(0.136)	(0.021)	(0.131)	(0.021)		
Municipality. 11-20 Health facilities	0.111	0.017	0.109	0.017		
	(0.145)	(0.022)	(0.142)	(0.022)		
Municipality. 20-50 Health facilities	0.435**	0.067**	0.483***	0.076***		
	(0.146)	(0.023)	(0.142)	(0.022)		
Municipality. 50 + Health facilities	0.983***	0.152***	1.015***	0.159***		
	(0.149)	(0.022)	(0.146)	(0.022)		
Rural area					-1.149***	-0.180***
					(0.081)	(0.011)
Cons.	-1.072***		-0.700*		0.463*	
	(0.313)		(0.292)		(0.215)	
N	6425		6422		6425	
Pseudo - R ²	0.281		0.274		0.272	

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001